# CHANGE ISSUE – RTCA/DO-242

# MASPS for ADS-B Rev. A

| Tracking Information (committee secretary only) | |
|---|---|
| Change Issue Number | 5 |
| Submission Date | 1/11/01 |
| Status (open/closed/deferred) | Rev A. – CLOSED |
| Last Action Date | 2/22/02 |

| Short Title for Change Issue: | Requirements Needed to Provide Anonymity Protection for GA aircraft. |
|---|---|

| MASPS Document Reference: | | Originator Information: | |
|---|---|---|---|
| Entire document (y/n) | | Name | Gary Livack / FAA |
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| Paragraph number(s) | | E-mail | Garret.Livack@faa.gov |
| Table/Figure number(s) | | Other | |

| Proposed Rationale for Consideration (originator should check all that apply): | |
|---|---|
| | Item needed to support of near-term MASPS/MOPS development |
| | DO-260/ED-102 1090 MHz Link MOPS Rev A |
| | ASA MASPS |
| | TIS-B MASPS |
| | UAT MOPS |
| | Item needed to support applications that have well defined concept of operation |
| | Has complete application description |
| | Has initial validation via operational test/evaluation |
| | Has supporting analysis, if candidate stressing application |
| | Item needed for harmonization with international requirements |
| | Item identified during recent ADS-B development activities and operational evaluations |
| X | MASPS clarifications and correction item |
| X | Validation/modification of questioned MASPS requirement item |
| | Military use provision item |
| | New requirement item (must be associated with traffic surveillance to support ASAS) |

| Nature of Issue: | | Editorial | X | Clarity | | Performance | | Functional |
|---|---|---|---|---|---|---|---|---|

Issue Description:

The attached comment **requesting that the 1090 MOPS specify a means of anonymity protection** was presented to the SC-186 plenary in reference to the ballot on the 1090 MHz ADS-B MOPS (DO-260). It was agreed that this issue would be deferred from consideration in DO-260 until **a clarification** is considered for inclusion in a future revision of the ADS-B MASPS. Included with the attached comments is the official response from working group 3, which was charted with development of DO-260.

Originator's proposed resolution:

Proposed resolution is attached with comments from DO-260 ballot.

Originator's proposed resolution (continued):

Alternate Resolution Proposals:

February 28, 2001: As a result of discussing this Issue Paper at the February 2001 ad hoc group meeting, Chris Moody (Mitre/CAASD) provided a draft paper on the use of Temporary ADS-B addresses, which has been included as attachment A of this Issue paper.

May 24, 2001: The ad hoc group agreed at their May 2001 meeting to base the resolution of this Issue Paper on 242A-WP-5-03, which has been included as attachment B of this IP. (See Ad Hoc Group Deliberations below.)

July 19, 2001: Specific MASPS changes based on 242A-WP-5-03 (see attachment B of this IP) were presented at the July WG6 meeting in Working Paper 242A-WP-6-02 (see attachment C of this IP).

Working Group 6 Deliberations:

May 24, 2001: This Issue Paper was discussed by the ad hoc group at their May 2001 meeting. 242A-WP-5-03, presented by Ron Jones. (See attachment B.) This IP will be addressed in Revision A. Ron Jones and Bill Flathers will be asked to develop specific language for the MASPS that would enable an anonymous mode based on 242A-WP-5-03. [AI 5-14].

July 19, 2001: Specific MASPS revisions to resolve this Issue Paper were presented at the July WG6 meeting in Ron Jones' paper 242A-WP-6-02. (See attachment C.) These proposed changes were mostly accepted by WG6. Two exceptions to this approval were the use of the prefix string "VFR", and the needed addition/clarification to have anonymous addresses or call signs reset if they encounter a duplicate within the same airspace. Ron Jones was asked to work with US authorities to find a suitable prefix for anonymous call signs [AI 6-11] and to propose updated language to require resetting of anonymous address and/or call sign when duplicates are detected. [AI 6-12]

August 30, 2001: The progress of this IP was reviewed at the August WG6 meeting. It was agreed that the material on call sign needed to say that when operating anonymously, call signs did not need to be broadcast at all. Instead, another aircraft receiving broadcasts from an anonymous participant can display the anonymous aircraft with either a blank prefix data block, or use all digits. Either would adequately signify the aircraft as an anonymous participant. Also, it was agreed that section 2.1.2.1.2 as proposed in 242A-WP-6-02 should be broken into two subsections where 2.1.2.1.2.1 will be for the 24-bit address, and 2.1.2.1.2.2 will be for an address qualifier that will categorize the address as ICOA, anonymous, TIS-B, etc. [AI 7-13]: Stuart Searight will update proposals in 242A-WP-6-02 to reflect these decisions.

February 1, 2002: The Issue Paper was revisited by WG6 at their January, 2002 meeting. Due to the event of September 11, 2001 it was agreed that the specific implememntations for anonomous mode would no longer be specified in the MASPS as earlier proposed. Instead, WG6 felt that the addition of the Address Qualifer field was sufficient for ADS-B to support anonymous mode operations if they will be permitted in the future. WG6 felt this issue should be considered by plenary in light of the events of September 11.

February 22, 2002: At the February WG6 meeting, the language for Address Qualifier was approved for inclusion in the draft DO-242A. It was agreed by WG6 that §2.1.2.2.2.2 in the draft DO-242A will close this Issue Paper.

Working Group 6 Final Resolution:

Below is section 2.1.2.2.2.2 which contains text for the new Address Qualifier field from the draft DO-242A delivered to RTCA March 4, 2002. This field will be contained in all reports that also contain the A/V address.

**2.1.2.2.2.2 Address Qualifier**

The Address Qualifier field **shall** (R2.12) be included in all ADS-B reports. This field consists of one or more bits and describes whether or not the Address field contains the 24-bit ICAO address of a particular aircraft, or another kind of address.

*Notes:*

1. *The particular encoding used for the Address Qualifier is not specified in this MASPS, but is left for specification in lower level documents, such as the MOPS for a particular ADS-B data link. Experience in developing the MOPS for several proposed ADS-B data links suggests that 4 bits is sufficient for the Address Qualifier field.*

2. *Surface vehicles for a given airport need to have unique addresses only within range of the airport; vehicle addresses may be reused at other airports.*

3. *A participant's address and address qualifier are included as parts of all reports about that participant.*

**ADS-B 1090 MHz Rev A Comments Related to MASPS Changes**
**RTCA SC-186 WG-3/EUROCAE WG-51 SG-1**

| # | Comment Author | DO-260 Section | Page | Comment / Rationale | Suggested Resolution |
|---|---|---|---|---|---|
| **5** | Livack (7) | 1.3.6 Other Applica-tions<br><br>2.2.5.1.11 Aircraft ID Data | 11<br><br>124 | General aviation issue. The function / process to achieve GA ADS-B anonymity protection when using the 1090 data link appears not to have been addressed. For example, in the UAT implementation in Alaska, by modifying the ICAO 24 bit code, the UAT implementation effectively moots the ability to use the assigned 24 bit ICAO registry data in conjunction with a look-up table to identify aircraft by Make / Model. A similar 1090 MOPS anonymity function needs to be specifically included in this current version of the MOPS. However, any CDTI or controller's display must maintain its ability to display aircraft make / model silhouettes but without the ID data tag.<br><br>**WG#3 Position:** *Need a uniform statement on the need for this in the MASPS, but if randomness is needed to get full anonymity, WG#3 has a great concern that randomness will cause duplicate addresses to appear within proximity of each other which violates the MASPS. WG#3 does not feel non-unique addresses are good, but if this is the unified RTCA position for broadcast-only devices, WG#3 can technically make it work.* | This is a policy issue that if not adequately addressed, will adversely affect GA fleetwide equipage. Suggest that this issue be addressed in the MOPS.<br><br>**Carried forward to the MASPS group after review by WG-3.** |

# IP05 Attachment A
# **DRAFT**

21 Sept 1999
Chris Moody
Revised 7 Feb 2001

## Use of Temporary ADS-B Addresses: in CAPSTONE…and Beyond

**1. Assumptions**
:

1. Its desirable to preserve a "1200 code" style of operation with ADS-B for cases where no ATC services are desired by the airspace user.
2. It would also be desirable to allow ADS-B users that require ATC services to employ a *temporarily* assigned ADS-B address (for flight duration) rather than a *permanent* airframe assigned address at their option.
3. Users desiring basic IFR services would not need to broadcast call sign/flight id as this could be provided to the controller via ATC automation. These users may or may not be eligible for certain "pairwise" air-air procedures as intended in the ADS-B MASPS.
4. State Vector reports are recoverable from ADS-B messages without the need for unique addressing (e.g., for message assembly).

**2. The Capstone Approach:**

1. UAT was designed to have a randomly generated address available for "1200 code" style operation. This is supported with an extension of the address field that supports additional address space. This new space will be used for randomly generated aircraft addresses.

2. If a user desires a temporary address, they select a temporary address option at unit startup time. A randomly generated field of bits is created based on a seed from e.g., the least significant bits of lat/lon fields at the location of startup/reset. The address extension field is set to indicate a temporarily assigned address so as not to conflict with the permanent assigned address space.

3. If user desires anonymity and no ATC service, no further action is needed.

4. If user desires ATC service[1]:
   a) If departing an airport with a control tower, the ground or local controller establishes the target's randomly generated address association with flight data (i.e., the "tag up")
   b) If the user is a pop-up in the system, then the user provides some discriminating state vector information on initial contact to allow the controller to establish the tag up with the random address (analogous to assigning beacon code and declaring "radar contact" currently).

**3. What if random addresses conflict?**

a) <u>What is the probability of observing no address conflicts</u>? This depends on the number of aircraft using random addresses that are observed via ADS-B at one time and the number of bits devoted to the random address. The table below gives a summary assuming a completely random address number generation:

[1] Current policy in Capstone is to require the permanent address for "radar-like" services.

| **Number of random address aircraft observed via ADS-B at any given time** | **Probability of observing no address conflicts amongst these aircraft** ($2^{24}$ random address space) |
|---|---|
| 1,000 | 0.97 |
| 100 | 0.999 |

This table indicates a potential problem for the simplest CDTI target update processing: one that employs no tracker but instead relies on unique addressing for display maintenance. This could be overcome at the expense of extra logic that checks for address conflicts and performs a simple proximity check that distinguishes the tracks of targets with address conflicts.

b) What is the probability of a given user selecting an address that will not conflict with anyone in ADS-B range during a flight?: The table below shows this

| **Number of aircraft with random addresses that pass within ADS-B range during a flight** | **Probability that a given user's random address is not involved in address conflict with these aircraft** ($2^{24}$ random address space) |
|---|---|
| 10,000 | 0.9994 |
| 1,000 | 0.99994 |
| 100 | 0.999994 |

Although far from an everyday occurrence, at some point any given user may be involved in an address conflict. Air-air, this is not a problem as the conflict is not really observable to our given user. It is however observable to ATC. If our user is receiving ATC service and the address conflict is a problem for ATC, the user could simply be instructed to reset the ADS-B unit, thus obtaining another random address. This is similar to current operations where users may be instructed to change transponder code during flight (there are only 4096 of these).

**4. Summary and Conclusions**

A concept for randomly assigned temporary (flight duration) addressing of ADS-B messages has been described for use with UAT in Capstone. It is proposed that this same concept of randomly generated, self-assigned, temporary addresses be supported more generally in ADS-B systems beyond Capstone. This approach both improves privacy and reduces administrative complexity relative to an approach that supports anonymity through a system using a "confidential address administrator". The main objective of the temporary address is to preserve the equivalent of "1200-style" transponder operation. However, it has been shown here that it may also be viable for "basic" IFR operations. This may be an important consideration should broadcast of identity information become a more widespread concern with the large scale use of ADS-B and potential wide availability of "consumer grade" ADS-B receivers.

# IP05 Attachment B

## RTCA Ad-Hoc MASPS Group
## 21-23 May 2001
Paper 242A-WP-5-03

**Prepared by Ron Jones**
FAA, ASD-140

Proposed Approach for an Anonymous ADS-B Mode

### 1. Background –

Certain general aviation user groups have expressed a desire to be able to utilize an anonymous aircraft address and flight ID as part of their ADS-B transmissions. The ADS-S MASPS allows for this capability for those aircraft that do not carry another CNS system that requires an aircraft address based on the ICAO 24-bit address. Currently the other airborne systems that require, based on existing ICAO SARPs and RTCA MOPS, the use of an ICAO 24-bit aircraft address are:

- Mode S transponders
- TCAS
- VDL Mode 2
- VDL Mode 3
- HFDL
- AMSS

The ADS-B MASPs does require the aircraft address to be unique and the general idea has been that only certain classes of general aviation users/airframes would be allowed to broadcast an anonymous address and fight ID. The following proposal is offered as an approach for accommodating the use of an anonymous ADS-B mode. However, the assurance of uniqueness of the aircraft addresses would not be assured for those aircraft using the anonymous ADS-B mode. However, this limitation may be addressed by placing operational constrains on the use of the anonymous service.

### 2. Proposal

#### 2.1 Provisions for an Anonymous ADS-B Mode

This proposal describes the provisions for the installation and use of avionics supporting an Anonymous ADS-B Mode as well as places certain constraints on the configuration of the ADS-B avionics that supports this capability.

a) All ADS-B aircraft installations would be required to support a standard (i.e., default) ADS-B mode using an ICAO conformant 24-bit aircraft address, as assigned by the FAA in the U.S., and a flight ID that corresponds to the aircraft's radio call sign (i.e., tail number or flight number).

b) Certain aircraft/installations, as defined below, would qualify to use ADS-B avionics that would also support an Anonymous ADS-B Mode. When operating in the Anonymous ADS-B Mode, the ADS-B avionics would broadcast a randomly selected 24-bit aircraft address and a flight ID (i.e., Call Sign) of the format VFRxxxx where the xxxx parameter is a randomly selected value between 0001 and 9999. The values for the aircraft address and flight ID would be automatically selected by the ADS-B avionics when entering the Anonymous ADS Mode and would not change for the duration of that operation (i.e., until the avionics is reset or until the pilot switches to Standard ADS Mode).

c) Pilots operating aircraft equipped with avionics supporting the Anonymous ADS-B Mode and operating under certain authorized conditions, as described below, would be allowed to manually elect to override the (default) Standard ADS-B Mode (i.e., using an ICAO conformant aircraft address and standard flight ID) and instead broadcast in an Anonymous ADS-B Mode using a randomly selected 24-bit aircraft address and a flight ID of the format VFRxxxx (neither of which would be correlated to the specific airframe nor specific user). The ADS-B message formats must provide an unambiguous indication of which mode is being used (i.e., Standard or Anonymous ADS-B mode). When the ADS-B avionics is powered up or reset it would default to the Standard ADS-B Mode unless or until the pilot takes a specific action to instead activate the Anonymous ADS-B Mode.

d) Any ADS-B avionics capable of the operating in an Anonymous ADS-B Mode would be required, as a minimum, to provide flight crew input and output functions for:

- Input:
  - manual override of the Standard ADS-B Mode to activate the Anonymous ADS-B Mode.
  - manual reset to default Standard ADS-B Mode

- Output:
  - Indicator showing when the ADS-B avionics is using the Anonymous ADS-B Mode
  - Display of the Flight ID that is being broadcast (e.g., tail number –or- VFRxxxx)

## 2.2 Airframe constraints on the use of anonymous aircraft address

ADS-B avionics capable of broadcasting in the Anonymous ADS-B Mode would only be authorized for use on the following aircraft classes:

a) powered fixed wing aircraft with a maximum operating ceiling of less than 18,000 feet;

b) unpowered aircraft/balloon;

c) ultralight powered vehicle;

d) rotorcraft.

### 2.3 Operational constraints on the use of the Anonymous ADS-B Mode

Only ADS-B equipped aircraft operating as uncontrolled VFR would be qualified to broadcast in the Anonymous ADS Mode. Any ADS-B equipped aircraft operating as IFR or controlled VFR would be required to broadcast in the Standard ADS-B Mode (i.e., ICAO conformant 24-bit aircraft address and a Flight ID containing the aircraft's radio call sign).

### 2.4 Use of Anonymous Flight ID

The provision of an anonymous Flight ID of the form VFRxxxx, and a pilot display showing the value being broadcast, would allow both the pilot of the broadcasting aircraft and all recipients of the ADS-B to display the target using the same flight ID value while also providing a reasonable degree of uniqueness. This would allow for any voice communications related to this target to be more readily correlated to the user's display (either controller's or other pilot's displays). However, the anonymity of the broadcasting aircraft is protected since the actual identify of the aircraft is known only to the pilot of the broadcasting aircraft.

## 3. Constraints on the use of ADS-B reports containing anonymous aircraft address and anonymous flight ID

Applications and operations will not be authorized to use ADS-B reports from target aircraft operating in an Anonymous ADS-B Mode for the purpose of providing aircraft separation services, de-confliction services, collision avoidance services, or any other safety critical service. However, situational awareness and See-and-Avoid services may be supported with targets using the Anonymous ADS-B Mode.

## 4. Recommendation

It is recommended that the RTCA MASPS, the 1090 MHz ADS-B MOPS and the UAT MOPS adopt the above proposed approach for support of an Anonymous ADS-B Mode. It is also proposed the RTCA coordinate with EUROCAE on this matter as it relates to the EUROCAE 1090 MHz ADS-B MOPS and the EUROCAE VDL Mode 4 MOPS.

# IP05 Attachment C

**242A-WP-6-02**
**2001 July 11**

**RTCA Special Committee 186, Working Group 6**

**ADS-B MASPS, rev. A**

**Meeting #6**

**Seattle, WA**

**Proposed changes to the ADS-B MASPS to more completely define the requirements for an ADS-B Anonymous Mode**

**Prepared by Ron Jones**

**Summary**

This working paper is a follow-up to Issue Paper 5 and Working Paper 242A-WP-5-03 and proposes specific changes to section 2.1.2.1 of DO-242 to further define the requirements and limitations on the use of an ADS-B anonymous mode.

### 2.1.2 Information Transfer Requirements

The ADS-B system shall (R2.1) be capable of transmitting messages containing the information specified in the following subsections. This MASPS does not specify a particular message structure or encoding technique. The information specified in the following subsections can be sent in one or more messages in order to meet the report update requirements specified in Section 3.

Message triggering may be event driven, e.g., entering the approach area, encountering turbulence, etc., or possibly may be turned on by crew action (e.g., emergency, priority handling, etc.). ADS-B applications will need to accommodate missing and/or temporary interruption of required data elements (e.g., if barometric altitude is missing).

#### 2.1.2.1 Identification

The basic identification information to be conveyed by ADS-B shall (R2.2) include the following elements:

1. Call Sign
2. Address
3. Category

The ADS-B system design shall (R2.3) accommodate a means to ensure anonymity whenever pilots elect to operate under flight rules permitting an anonymous mode as described in 2.1.2.1.4. (Most non-IFR flight operations do not require one to fully disclose either the A/V call sign or address. This feature is provided to encourage voluntary equipage and operation of ADS-B by ensuring that ADS-B messages will not be traceable to an aircraft if the operator requires anonymity.)

##### 2.1.2.1.1 Call Sign

ADS-B shall (R2.4) be able to convey an aircraft call sign of up to 7 alphanumeric characters in length [6]. For aircraft/vehicles not receiving ATS services, but providing an ICAO conformant 24 bit aircraft address, and military aircraft the call sign is not required. The use of an anonymous call sign is discussed in 2.1.2.1.4.1 below.

##### 2.1.2.1.2 Address

The ADS-B system design shall (R2.5) include a means (e.g., an address) to 1, correlate all ADS-B messages transmitted from the A/V and 2, differentiate it from other A/Vs in the operational domain.

Those aircraft requesting ATC services will be required in some jurisdictions to use the same 24 bit address for all CNS systems. Aircraft with Mode-S transponders using an ICAO 24 bit address shall (R2.6) use the same pre-assigned ICAO 24 bit address for ADS-B**.** Aircraft requesting ATC services shall use the ICAO 24 bit aircraft address for ADS-B. All aircraft/vehicle pre-assigned addresses shall (R2.7) be unique within the operational domain(s) applicable. The use of anonymous aircraft addresses is discussed in 2.1.2.1.4.2 below.

***Note 1. For example, all surface vehicles for a given airport need to have unique addresses only within range of the airport; vehicle addresses may be reused at other airports.***

***Note 2. Correlation of ADS-B messages with transponder codes will facilitate the integration of radar and ADS-B information on the same A/V during transition.***

***Note 3. ATC correlation of ADS-B reports with IFR flight plans will be facilitated by the use of ICAO 24-bit aircraft addresses.***

### 2.1.2.1.3 Category

Aircraft/vehicle category, as defined by ICAO[6], shall (R2.8) be one of the following:

1. Light aircraft - 7,000 kgs (15,500 lbs) or less
2. Reserved
3. Medium aircraft - more than 7,000 kgs and less than 136,000 kgs (300,000 lbs)
4. Reserved
5. Heavy aircraft 136,000 kgs or more
6. Highly maneuverable ( > 5g acceleration capability) and high speed (> 400 knots cruise)
7. Reserved
8. Reserved
9. Reserved
10. Rotorcraft
11. Glider/Sailplane
12. Lighter-than-air
13. Unmanned Aerial vehicle
14. Space/Transatmospheric vehicle
15. Ultralight/Hangglider/Paraglider
16. Parachutist/Skydiver
17. Reserved
18. Reserved
19. Reserved
20. Surface Vehicle - emergency vehicle
21. Surface Vehicle - service vehicle
22. Fixed ground or tethered obstruction
23. Reserved
24. Reserved

*Note. 2, 4, 7-9, 17-19, 23 and 24 reserved for future assignment.*

### 2.1.2.1.4 Anonymous Mode

All ADS-B aircraft installations shall use, as a default mode, the assigned aircraft address conformant to ICAO standards. Likewise all ADS-B aircraft required to include a radio call sign with ADS-B shall provide, as a default mode, a radio call sign based on aircraft tail number or flight number. Certain aircraft, installations and operations, as defined below, are permitted to also support the optional use of an anonymous mode. When operating in the anonymous mode neither the flight ID nor the call sign would be uniquely associated with a specific aircraft or operator. ADS-B messages shall unambiguously identify when the anonymous mode is in use.

All ADS-B avionics shall power-up in the default mode. Use of anonymous mode shall require the flight crew to manually override the default mode.

#### 2.1.2.1.4.1 Anonymous Call Sign

When operating in an anonymous mode ADS-B equipped aircraft shall transmit the call sign in the form "VFRxxxx", where xxxx is a randomly selected 4 digit number within the range of 0001 to 9999. The value for the call sign shall be automatically selected when entering the anonymous mode and shall not change for the duration of that anonymous operation (i.e., until the ADS-B avionics is reset or until the avionics is switched out of anonymous mode).

> *Note. Coordination with ICAO will be necessary to reserve the radio call sign prefix "VFR".*

#### 2.1.2.1.4.2 Anonymous Aircraft Address

When operating in an anonymous mode ADS-B equipped aircraft shall transmit a randomly selected value for the aircraft address. The anonymous aircraft address shall be as a minimum 24-bits in length. The random value for the aircraft address shall be automatically selected when entering the anonymous mode and shall not change for the duration of that anonymous operation (i.e., until the ADS-B avionics is reset or until the avionics is switched out of anonymous mode).

> *Note. Alternative techniques are possible to ensure a high degree of randomness for the generation of the anonymous aircraft address. One possible technique would be extract data from the latitude, longitude and/or time information to initiate the random value generator function.*

#### 2.1.2.1.4.3 Fight Crew Input/Output Functions

ADS-B avionics supporting the option for anonymous mode operation shall provide the following flight crew input and output functions:

- Input

  a. manual override of the default ADS-B mode to activate the anonymous mode

  b. manual reset to the default ADS-B mode

*Note. A feature to automatically reset the ADS-B avionics from anonymous mode to default mode based on the aircraft exceeding a pre-set altitude threshold (e.g., 18,000) is permitted. In such cases a manual flight crew reset capability is still required.*

- Output

  a. indicator showing when the ADS-B avionics is operating in the anonymous mode

  b. display of the call sign that is being broadcast (i.e., either the anonymous call sign of the form "VFRxxxx" or the default mode radio call sign based on aircraft tail number of flight number)

#### 2.1.2.1.4.4 Allowed use of Anonymous Mode

The use of anonymous mode is allowed only for the following aircraft/vehicle categories, as per 2.1.2.1.3:

a. powered fixed wing aircraft (categories 1, 3, 5 and 6) operating below 18,000 feet altitude;

b. rotorcraft (category 10);

c. glider/sailplane (category 11);

d. lighter-than-air (category 12) ;

Furthermore, the use of anonymous mode is only allowed for uncontrolled VFR operations (i.e., any ADS-B equipped aircraft operating as IFR or controlled VFR would be required to broadcast an ICAO conformant 24-bit aircraft address and the radio call sign based on aircraft tail number or flight number).